CLAIMS

1. A cellular telephone a multi-band antenna apparatus comprising:

a multi-band antenna; and

a grounded helical antenna surrounding the multi-band antenna.

2. The multi-band antenna apparatus as in claim 1 further comprising:

a cellular telephone housing formed of a conductive material; and

a printed circuit board (PCB) carried by the cellular telephone housing, the PCB having a metalized ground plane, the metalized ground plane and the grounded helical antenna coupled to the cellular telephone housing.

3. The multi-band antenna apparatus as in claim 2 wherein the multi-band antenna comprises a helical antenna coupled to a monopole antenna.

4. The multi-band antenna apparatus as in claim 3 wherein the grounded helical antenna includes turns around a linear axis, a distance between at least some adjacent turns of the grounded helical antenna varying along the linear axis.

5. The multi-band antenna apparatus as in claim 4 wherein the grounded helical antenna comprises a top section and a lower section along the linear axis, the lower section coupled to the metalized ground plane and the top section located at an end opposite the lower section along the linear axis, a distance between adjacent turns of the top section narrower than a distance between adjacent turns of the lower section.

6. A cellular telephone antenna comprising:

an inner antenna; and

a radio frequency (RF) grounded helical antenna surrounding the inner antenna, the RF grounded helical antenna including,

a first section having a distance between adjacent turns of a first predetermined amount, and

a second section having a distance between adjacent turns of a second predetermined amount, the second predetermined amount less than the first predetermined amount.

7. The cellular telephone antenna as in claim 6 wherein a resonant frequency of the RF grounded helical antenna is substantially equal to a resonant frequency of the inner antenna.

8. The cellular telephone antenna as in claim 6 further comprising:

a cellular telephone housing formed of a conductive material; and

a printed circuit board (PCB) carried by the cellular telephone housing, the PCB having a metalized ground plane, the metalized ground plane and the RF grounded helical antenna coupled to the cellular telephone housing.

9. The cellular telephone antenna as in claim 6 wherein the inner antenna comprises an inner helical antenna.

10. The cellular telephone antenna as in claim 9 wherein a resonant frequency of the RF grounded helical antenna is substantially equal to a resonant frequency of the inner antenna.

11. The cellular telephone antenna as in claim 10 further comprising:

a cellular telephone housing formed of a conductive material; and

a printed circuit board (PCB) carried by the cellular telephone housing, the PCB having a metalized ground plane, the metalized ground plane and the RF grounded helical antenna electrically coupled to the cellular telephone housing.

12. A cellular telephone antenna comprising:

a monopole antenna tuned to a first resonant frequency of operation;

a first helical antenna coupled to the monopole antenna and having turns surrounding the monopole antenna, the first helical antenna tuned to a second resonant frequency of operation; and

an electronically grounded second helical antenna surrounding the first helical antenna, the electronically grounded second helical antenna formed to have an upper capacitive loading segment to tune the electronically grounded second helical antenna at substantially the second resonant frequency of operation.

13. The cellular telephone antenna as in claim 12 further comprising:

a cellular telephone housing formed of a conductive material; and

a printed circuit board (PCB) carried by the cellular telephone housing, the PCB having a metalized ground plane, the metalized ground plane and the electronically grounded second helical antenna coupled to the cellular telephone housing.

14. A cellular telephone comprising:

transmitter for transmitting signals;

a receiver for receiving signals;

a synthesizer coupled to the transmitter and receiver for generating carrier frequency signals;

a controller for controlling operation of the cellular telephone;

a first helical antenna coupled to the transmitter and the receiver, the first helical antenna tuned to a resonant frequency of operation; and

a grounded helical antenna surrounding the first helical antenna, the grounded helical antenna formed to have a first section of adjacent helical turns that are spaced farther apart than adjacent helical turns of the first helical antenna, the grounded helical antenna formed to have an upper capacitive loading segment to tune the grounded helical antenna to substantially the resonant frequency of operation.

15. The cellular telephone as in claim 14 further comprising:

a cellular telephone housing formed of a conductive material; and

a printed circuit board (PCB) having a metalized ground plane, the metalized ground plane and the grounded second helical antenna coupled to the cellular telephone housing.

16. The cellular telephone as in claim 15 further comprising a monopole antenna coupled to the first helical antenna and tuned to a second resonant frequency of operation.